EERC Proposal Entitled “Development of Economically Sustainable Distributed Power from Biomass Gasification for North Dakota”

There have been unanticipated development issues that prevent accomplishing the scope of work as originally outlined. The Energy & Environmental Research Center (EERC) is proposing a revised scope of work to accommodate these changes while meeting the original intent of the proposed project. Specific changes to the original task structure are outlined below.

Task 1 – Demonstrate Long-Term Operation of Biomass Gasification

The original scope for this task was to monitor operation of the EERC’s 50-kW$_e$ gasification system for 3 months of normal operation. Because of unforeseen development issues, the transition of the system from research and development testing to day-to-day normal operation will not occur within this project’s period of performance as originally assumed. Instead of the long-term operating data, significant development and short-term operating experience information has been collected. This information will be summarized and reported to the NDREC as planned.

Task 2 – Demonstrate Use of North Dakota Biomass Fuels

The EERC’s 50-kW$_e$ gasification system was to serve as a test bed for several biomass fuels relevant to North Dakota’s economy. Fuel samples were to come from North Dakota entities interested in distributed gasification. Unfortunately, the delay in the development of the 50-kW$_e$ system means that this work cannot proceed as planned. As an alternative, design data have been collected with relevant feedstocks on other EERC gasification systems, and this work continues. Some of the fuels already tested and those planned for evaluation include waste wood, energy crops, agricultural residues, etc. These data will now be incorporated into the educational materials of Task 3 and will be shared with interested North Dakota entities through the distribution of these materials.

Task 3 – Develop Educational Materials

The original deliverable from this task was a workbook for potential users to conduct a self-assessment for the technical and economic appropriateness of biomass gasification for a specific site, including estimates of needed biomass feed and resulting heat and power produced. This workbook will maintain the same scope as outlined; however, it will not contain conclusions from the long-term testing originally planned for Task 1. Instead, specific design data collected under the revised Task 2 for North Dakota fuels will be included for initial resource assessments and used for workbook examples. Presentation and preliminary distribution of the workbook will be conducted as part of a gasification workshop that will be held at the EERC.

Task 4 – Reporting

Reports will be generated as originally planned but will reflect the modifications noted above.

opportunity to perform continued evaluation of the emissions, solid by-products, and wastewater handling for small gasifiers.

OBJECTIVES

The overall goals of the effort are to demonstrate long-term heat and power generation through biomass gasification and to educate North Dakota entities on the opportunities for use of local biomass for heat and power generation for small industrial and agricultural operations. Supporting objectives are to demonstrate the gasification of specific biomass feedstocks as an evaluation of fuel appropriateness and operational issues and to develop increased information of the use and maintenance of the gasification system for long-term use.

METHODOLOGY

Task 1 – Demonstrate Long-Term Operation of Biomass Gasification

Using the existing 50-kW gasification system in Grand Forks, North Dakota, the operation of the system with on-site wood waste fuel will be demonstrated for 3 months, with appropriate maintenance. Operation and maintenance procedures will be documented, including emission testing for 1 week of testing, recycle rate of char, final disposition of solid by-product, and wastewater production and management. Heat and power will be used on-site, or electricity will be fed to the grid depending on the on-site needs. The facility will be available for viewing by interested parties during this long-term testing. Results of this testing will be reported to the North Dakota Renewable Energy Commission and other interested parties.

Task 2 – Demonstrate Use of North Dakota Biomass Fuels

Potential users of biomass fuels and gasification will be identified using available resources at the EERC and will be provided with information on the opportunities for biomass gasification. Interested parties will be invited to view the Grand Forks gasification system where additional information will be provided during the on-site visit. Discussions will be held regarding the technical and economic

appropriateness of gasification for their specific site, fuel, and heat and power needs. Selected parties will be invited to provide biomass fuels for testing at the Grand Forks facility. Up to five biomass fuels are expected to be tested for 1-week tests. Results will be provided to the biomass fuel supplier, and preliminary design and economic evaluation information will be developed for the site of interest. On conclusion of the proposed five biomass fuel tests, the results will be assembled and made available to the North Dakota Renewable Energy Commission and other interested parties in North Dakota.

Task 3 – Develop Educational Materials

The information assembled in Tasks 1 and 2 will be used to prepare educational materials for potential users of biomass gasification in North Dakota. It is anticipated that the material will include a workbook for potential users to conduct a self-assessment for the technical and economic appropriateness of biomass gasification for a specific site requiring input estimates of biomass available and heat and power needs.

Task 4 – Reporting

- Quarterly reports submitted during the month following the end of the calendar quarter.
- Report of results of Task 1 long-term biomass gasification demonstration.
- Report of results of Task 2 individual testing for interested North Dakota parties.
- Educational materials, including a preliminary workbook for potential biomass gasification users.
- Comprehensive final report on conclusion of the effort.

ANTICIPATED RESULTS/IMPACT

- Potential industry and agricultural users of biomass gasification will be educated on the benefits, costs, operation, and maintenance of biomass gasifiers for on-site heat and power generation.
- North Dakota biomass feedstocks will be evaluated in the existing gasification demonstration unit.